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TITLE: ELECTROLYTE COMPOSITION FOR ELECTROCHEMICAL MACHINING  
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ABSTRACT:

PURPOSE: To simultaneously carry out two electro-chemical machinings besides a single machining such as electrolytic deburring work or electrolytic polishing by constituting the composition of electrolyte only, or of the electrolyte and one or more of an oxidizing agent, a polarization improver and a corrosion inhibitor.

CONSTITUTION: In order to continuously and stably dissolve the surface of the material to be machined as an anode side, components such as 1) electrolyte for stably securing energization, 2) an oxidizing agent for accelerating the dissolution of metal ions from the surface of a material to be machined, 3) a polarization improver for maintaining the concentration polarization for uniformly dissolving the surface to be machined, and 4) a corrosion inhibitor for preventing the corrosion of the metal surface by etching components, are used fundamentally. The components may contain one or more kinds of 2)-4).

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(54) 【発明の名称】 電解加工用電解液組成物

(57) 【要約】

【目的】 電解バリ取りと電解研磨を含む電解加工を実施する上で、これら電解バリ取り、電解研磨のうちのどちらかを単一に実施するか、またはこれら2つを同時に実施するに当たって、最適な電解加工用電解液を提供する。

【構成】 電解バリ取りと電解研磨を含む電解加工用の電解液組成を組み立てる上で、基本的に、①通電を安定に確保する電解質と、②被加工物である金属表面を溶解するために表面を酸化する酸化剤と、③濃度分極を維持する分極向上剤と、④金属表面がエッチング性成分によって腐食するのを防止する抑制剤（インヒビター）のうち、上記①の電解質を基本として含むか、または上記①の電解質と更に上記②～④中のいずれか1種または2種以上を組み合わせて、電解液組成物を構成する。

## 【特許請求の範囲】

【請求項1】 電解バリ取り、電解研磨のどちらかを単一に実施するか、またはこれら両方を組み合わせて同時に実施することを目的とした電解加工液組成物において、基本的に、①電解質、②酸化剤、③分極向上剤、④腐食抑制剤（インヒビター）のうち、基本的に上記①の電解質だけを含むか、または上記①の電解質と、更に上記の②～④中のうちいずれか1種または2種以上を組み合わせることを特徴とする電解加工用の電解液組成物。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、原子炉用精密用、半導体加工装置用の金属パイプ、電子材用接点材や回路部品や電子用および機械機器用の精密部品などを製造する工程において、部品の金属表面を予め機械加工した後、または金属表面を予め何らかの加工を行うことなく直接、所望の平滑度／または粗さに整えるために、電解バリ取り、電解研磨の電解加工を実施するのに用いる電解液組成物である。これらの電解加工用電解液組成物は、本発明者らが、特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等として特許出願した電解バリ取り、電解研磨を行うための電解加工装置及び電解加工方法において、所望の効果をj得るのに好適な電解液組成物に関するものである。

【0002】本発明で言う電解加工の装置と方法は、既に上記の特許出願明細書に詳しく記載されているが、被処理物側を陽極にして電解処理を行う際に、溶液の流動のオンオフと電解電圧（または電解電流）の強弱を同期させると、選ぶ電解電圧（または電解電流）のレベルによって、バリ取り（研削）、研磨（平滑化）を単一に実施したり、一回の処理でこれら2つを組み合わせるjて同時処理することが出来る。

【0003】この原理を利用して、装置を变形すると、回転円盤状セル内で電解加工する方式になったり、連続処理化することが可能になる。最終的には、連続処理において、適当な電解加工液の流速と、電解電流密度（または電解電圧）を設定すると、特に電解加工液の流速を複雑に流速変化させなくても、バリが出ている部分の近傍では、平坦部分と比べるとバリの突出により相対的に高流速が発生すると同時に突出部が高電流密度部にもなるので、バリ発生部が研削を受けて、平坦部では液が相対的低流速となるために、研磨平滑化を受けるので、電解バリ取りと電解研磨が同時に行える様になる。

## 【0004】

【従来の技術】従来の電解加工、特に電解研磨では、電解液を一定電流を流すか、電流反転電解法などにより正・負の電圧を交互に印加する方法は既に公知の技術として知られているが、一定電流通電方式は、バリ取りと平

滑化研磨は別途に実施する必要があり、電流反転方式は電流反転をコントロールする専用装置が必要のため高価に付くが陽極電解を異なる電流・電圧で行える訳ではないため、これもバリ取りと平滑化研磨は別々に実施せざるを得ない。

【0005】また、先行技術である特開昭62-278299では、電解研磨において基準電流に短時間の高電流を間欠的に付加し、陽極側被研磨物の表面上に蓄積するガスを除去して研磨効率を上げる試みをしているが、この高電流領域で数秒間時間を保つと素地荒れが発生する問題点が発生する。

【0006】従って、従来の電解加工技術では、一回の処理で単一目的の加工しか実施できず、必然的に用いられている電解液も、バリ取り、平滑化研磨などのいずれも単一の加工のための電解液であって、一度にバリ取り研削と平滑化研磨を同時に実施する目的で開発された電解液は全く見い出されていない状況であった。

## 【0007】

【発明が解決しようとする課題】本発明は、以上に述べた従来の金属表面の電解加工技術に対して、所望の平滑度に整えるために電解バリ取りと電解研磨の電解加工をそれぞれ単一に実施するか、またはこれら2つの処理を組み合わせるjて同時に実施するための電解液組成物に関するものである。本発明の電解加工用の電解液組成物は、本発明者らが、特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等として特許出願した電解バリ取りと電解研磨用の装置及び方法において、所望の電解加工の効果をj得るために好適な電解液組成物に関するものである。

## 【0008】

【課題を解決するための手段】本発明の電解バリ取り、電解研磨などの電解加工を単一に実施するか、またはこれら2つの電解加工を同時に実施するための電解液組成物を組み立てるには、いずれも基本的に、被加工物側を陽極にしてその表面を持続的に安定して溶解するために、まず①通電を安定に確保する電解質と、②被加工物である金属表面を溶解するために、表面からの金属イオン溶解を促進する酸化剤と、③被加工物表面を均一に溶解するに当たって、濃度分極を維持する分極向上剤と、④金属表面がエッチング性成分によって腐食するのを防止する抑制剤（インヒビター）など各種成分のうち、基本的に上記①の電解質を含むか、または更に上記の②～④中のいずれか1種または2種以上を組み合わせるj用いる。

## 【0009】

【手段の詳細な説明】次に、電解バリ取り、電解研磨のどちらかを単一処理するか、またはこれら2つを同時に処理するために用いる電解液組成について、以下に詳しく説明する。

## 【0010】①電解質

電解質は、電解加工液の通電性を確保する基本成分となり、それ自体に通電性があることと、電解質は加工目的の金属が溶解した際に、水溶性が良好である金属塩か、またはある程度水溶性の金属塩を作ることが必要である。この目的のためには、次の電解質を挙げることができる。

【0011】・硫酸、硝酸、塩酸、リン酸などの単体および混合物

・上記酸のナトリウム塩、カリ塩、アンモニウム塩  
・水酸化ナトリウム、水酸化カリ

これらの電解質は、電解液として使用する際の濃度は、各電解加工に必要な通電性を確保できる濃度から各電解質の溶解度限度の間で使用する事が出来る。これらの電解質は、所定の通電性が確保できない濃度では、無理に通電すると陽極側の素材が素地荒れを起こしたり、表面に不溶性皮膜を形成する。また溶解度以上に濃度を上げてコスト・アップになるばかりで何らメリットが無く、電解質それ自体と、他の必要成分の両方の溶解性を阻害するので望ましくない。

## 【0012】②酸化剤

酸化剤は、被加工物である金属表面の溶解を促進する。その形態は、金属や酸化剤の種類にもよるが、例えば、酸に不溶性である金属酸化して表面に金属酸化物が生成すると、陽極近傍のPH低下によって発生した酸の実体である水素イオンが金属酸化物を溶解して、金属表面を削ることが可能になったり、また酸化剤の共存下で陽極電解を実施した時に、被処理物である金属表面から容易に金属が溶解するのを補助したりする。従って、いずれの経路を取るにしても、結果として酸化剤の働きは、陽極金属表面から金属イオンが溶解するのを促進する効果がある。

【0013】・無水クロム酸、クロム酸塩、重クロム酸塩などのクロム酸化合物

・塩素酸や過塩素酸、過硫酸の酸自体とナトリウム、カリおよびアンモニウム塩などの酸化性オキソ酸塩類

これらの酸化剤は、電解質と同様に電解液として使用する際の濃度として、0.5～250g/L、望ましくは1～220g/Lで使用する事が出来る。これらの酸化剤は、0.5g/L以下では持続的な酸化力が確保できない。また250g/L以上では、これ以上濃度を上げてコスト・アップになるばかりで何らメリットが無い。

## 【0014】③分極向上剤

分極向上剤は、被加工物表面を平滑に溶解するに当たって、濃度分極を維持するもので、本発明者らが、特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等として特許出願した電解バリ取り、電解研磨のための装置及び方法において記述されている「ヤッ

ケ層」形成を促進する成分である。

【0015】・ゼラチン、グリセリン、デンプン、カルボキシメチルセルロースNa塩(CMC)、アルギン酸ナトリウムなどの水に可溶性粘性付与剤、

・グリシン、EDTA・2Naなどのアミノカルボン酸とその塩、

・エタノールアミン類(モノー、ジエー、トリーエタノールアミン、トリイソプロパノールアミンなど)：ポリアルキレンポリアミン(ジエチレントリアミン、トリエチレンテトラミンなど)：ヒドロキシ置換ポリアルキレンポリアミン(ヒドロキシエチルエチレンジアミンなど)などのアミン類、

・シュウ酸、マロン酸などの多価カルボン酸のナトリウム・カリ塩、

・クエン酸、グルコン酸、酒石酸などナトリウム塩、カリ塩などの金属と安定な可溶性錯化合物を形成する化合物など、が使用できる。分極向上剤は、電解液として使用する際の濃度として、0.1～150g/L、望ましくは0.5～100g/Lで使用する事が出来る。濃度の下限である0.1g/L以下では、添加量が少な過ぎて所望の平滑化効果が得られず、150g/L以上では、場合により陽極素材の溶解を促進しすぎたり、電解液の粘度を過剰に上昇したりして問題を生じる。

## 【0016】④抑制剤

酸化剤や錯化剤などのエッチング促進性成分によって金属表面が腐食し、目的の表面状態が損なわれることを防止する成分で、工業的に広く用いられている酸洗用インヒビター、防錆性成分などがこれに相当する。

【0017】ジシクロヘキシルアンモニウム塩、脂肪酸アミン(オレイルアミン、ステアリアルアミンなど)やポリアルキレンポリアミン(ジエチレントリアミン、トリエチレンテトラミン、テトラメチレンテトラミンなど)などの高級脂肪酸(炭素数C10～C20のアルキル基を持つカルボン酸)塩などのアミン系有機物、ジアルキルチオ尿素(アルキル：エチル、ブチルなど)、モルホリン、イミダゾールやベンゾトリアゾールなどの誘導体などが用いられる。

【0018】これらの抑制剤は、電解液として使用する際の濃度として、0.1～10g/L、望ましくは0.5～5g/Lで使用する事が出来る。使用出来る濃度下限の0.1g/L以下では、これらの成分によるインヒビター効果が満足に得られず、金属表面の素地荒れを抑制できない。また、上限の10g/L以上では、これらが比較的高価な成分であり、これ以上濃度を上昇しても効果が期待できないし、これらの抑制剤が金属表面に強く吸着して有害でもある。

【0019】以上に説明した、本発明の電解加工用の電解液組成物の構成成分を組み合わせることによって、電解バリ取り、電解研磨を単一に処理するか、または同時に処理することが可能になる。

## 【作用】

【0020】本発明の電解加工用電解液組成物は、上記に示した電解バリ取り・電解研磨の用途に用いることで優れた電解加工性が得られるが、本発明電解液を用いることによって得られる効果と成分の働きを関連付けて説明すると、次のようになる。

【0021】通電性を確保するための電解質、加工表面に可溶性酸化膜を形成しつつ同時に酸化膜により表面の保護を行ったり、陽極電解を行う際に金属表面から金属イオンが溶出するのを促進する酸化剤や、金属の電解溶出過程において金属表面に吸着して腐食を防止する抑制剤の働きは自明であるが、本発明の電解液組成物中の分極向上剤は、本発明者らが特許出願した特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等に記載した電解加工の装置および方法において極めて重要である。

【0022】電解質、酸化剤、抑制剤などの成分と分極向上剤が共存する電解液中で、上記の各特許出願に記載される装置と方法を用い電解加工を行うと、被加工物表面にヤッケ層が生成したり消滅させることにより、バリ取り研削、平滑化研磨を使い分けすることが出来る。

【0023】ヤッケ層の厚みをコントロールすることによって、ヤッケ層の厚みを極めて薄くし、高電圧または高電流下で陽極電解すると、陽極表面でバリ取り研削が行われ、またヤッケ層を厚くして電解すると平滑化研磨が行われるようになる。

【0024】分極向上剤は、被加工物である陽極近傍に、高濃度状態で溶出した金属イオンを錯化剤により可溶化し、液粘度を増加して、高粘度、高物質濃度のヤッケ層が形成されるのを促進し、電解バリ取り、電解研磨などの電解加工を単一に処理するか、または同時に処理することを可能にする。

## 【実施例】

【0025】本発明の電解加工用電解液を用いて、電解バリ取りと電解研磨を行った場合の効果について、以下に具体的な例を挙げて詳細に説明する。

## &lt;実施例1&gt;

黄銅の電解研磨：

〔電解液組成と電解条件〕

(液組成)

硫酸アンモニウム 100g/L

酢酸アンモニウム 100g/L

(条件)

陽極電流密度(DA) 3A/cm<sup>2</sup>

電解液温度 室温

電解時間 3秒

電解液の流速 1m/秒

厚み0.36mm×幅33.5mmの黄銅条材(JIS

H3100:C2600)を、上記の組成を用いて、

特願平5-213202中の図2の装置概念図に示した連続電解装置を用いて、上記の条件で電解研磨を行った。電解研磨前後で、素材の表面粗さを比較すると、Ra値は、処理前に1.0μmであったものが、処理後には、0.05μmが得られた。

## 【0026】&lt;実施例2&gt;

黄銅の電解バリ取りと電解研磨の同時実施：実施例1と同一の素材、同一の連続電解装置を用い、電解条件のうち電解液の流速だけを2m/秒とし、あとは実施例1と同一条件にして、バリ取りと研磨を同時に実施した。処理前の素材のバリ発生した切断部と平面部のRaは、それぞれ5μm、1.0μmであったが、処理後の各Raは、それぞれ1.0μm、0.05μmとなり、バリ取りと研磨が同時に行われたことが分かる。

## 【0027】&lt;実施例3&gt;

アルミニウムの電解研磨：

〔電解液組成と電解条件〕

(液組成)

リン酸 93wt%

硫酸 90ml/L

重クロム酸カリ 6g/L

(条件)

陽極電流密度(DA) 1A/cm<sup>2</sup>

電解液温度 室温

電解時間 2秒

電解液の流速 1m/秒

厚み0.34mm×幅27.5mmのアルミニウム条材

(JIS H4000:A5082)を、上記の組成を用いて、特願平5-79713の図3の装置概念図に示した連続電解装置を用いて、上記の条件で電解研磨を行った。電解研磨前後で、素材の表面粗さを比較すると、Ra値は、処理前に1.5μmであったものが、処理後には、0.01μmが得られた。

## 【0028】鉄の電解研磨：

〔電解液組成と電解条件〕

(液組成)

硫酸 50ml/L

クエン酸 50ml/L

(条件)

40 陽極電流密度(DA) 2A/cm<sup>2</sup>

電解液温度 室温

電解時間 5秒

電解液の流速 1m/秒

厚み0.6mm×長さ50mm×幅50mmに切断した冷間圧延鋼板(JIS G3141:SPCC-B)を、

上記の組成を用いて、特願平4-301179中の図1の装置概念図に示したバッチ式電解装置を用いて、上記の条件で電解研磨を行った。電解研磨前後で、素材の表面粗さを比較すると、Ra値は、処理前に2.0μmであったものが、処理後には、0.01μmが得られた。

## 【0029】

【発明の効果】電解バリ取り、電解研磨を含む電解加工において、本発明の電解液組成物を、本発明者らが特許出願した特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等に記載してあるバッチ式または連続式の電解加工装置および加工方法に適用することによって、これら電解バリ取り、電解研磨のうちどちらかを単一に実施するか、またはこれら2つ同時に実施す

ることが可能になる。

【0030】この結果、本発明の電解液組成物と、本発明者らが既に出願している電解加工装置と電解加工方法（特願平4-301179、特願平5-28238、特願平5-79713、特願平5-132302、特願平5-213202等）を組み合わせることによって、プレス後の金属端面のバリ取りと表面平滑化による鏡面化が、それぞれ単独にまたは同時に実施できるようになる。

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] In the process which manufactures the metallic pipe, the contact material for electronic material and passive circuit elements the object for reactors for precisions, and for semi-conductor processing equipments, the precision components for the object for electrons, and machine devices, etc., this inventions are electrolytic flash cutting and an electrolytic-solution constituent used for carrying out electrochemical machining of electrolytic polishing, in order to raise a surface of metal to desired smoothness/or granularity directly, without performing a certain processing beforehand after machining the surface of metal of components beforehand or. These electrolytic-solution constituents for electrochemical machining are related with a suitable electrolytic-solution constituent for this invention persons to acquire desired effectiveness in the electrochemical-machining equipment and the electrochemical-machining approach for performing the electrolytic flash cutting and electrolytic polishing which carried out patent application as Japanese Patent Application No. 4-301179, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, and Japanese-Patent-Application-No. 5-213202 grade.

[0002] Although the equipment and the approach of electrochemical machining which are said by this invention are already indicated in detail by the above-mentioned patent application specification If turning on and off of a flow of a solution and the strength of electrolytic voltage (or electrolytic current) are synchronized in case a processed material side is made into an anode plate and electrolysis processing is performed, with the level of the electrolytic voltage (or electrolytic current) to choose Trimming (grinding) and polish (smoothing) can be carried out individually, or can be processed simultaneously combining these two by one processing.

[0003] If equipment is transformed using this principle, it will become the method which carries out electrochemical machining within a rotation disc-like cel, or it will become possible to consecutive-processing-ize. If the rate of flow and electrolytic current consistency (or electrolytic voltage) of suitable electrochemical-machining liquid are set up, even if it finally will not carry out the rate-of-flow change especially of the rate of flow of electrochemical-machining liquid intricately in consecutive processing Since a lobe also turns into the high current density section near [ out of which weld flash has come ] the part at the same time the high rate of flow occurs relatively by the protrusion of weld flash compared with a part for a flat part Since liquid serves as the relative low rate of flow in response to grinding at a flat part and the weld flash generating section receives polish smoothing, electrolytic flash cutting and electrolytic polishing can carry out to coincidence.

[0004]

[Description of the Prior Art] Although the conventional electrochemical machining and the method of especially pouring the electrolytic solution for a fixed current by electrolytic polishing, or impressing a forward and negative electrical potential difference by turns with a current reversal electrolytic decomposition process etc. are already learned as a well-known technique Since the dedicated device which controls current reversal is required for a current reversal method, although trimming and smoothing polish need to carry out a fixed current energization method separately, and it is attached at an expensive price, since anode plate electrolysis cannot necessarily be performed on different current and electrical potential difference, Trimming and smoothing polish also cannot but carry this out separately.

[0005] Moreover, although the attempt which adds a short-time high current to reference current intermittently in electrolytic polishing, removes the gas accumulated on the front face of the object ground [ anode plate side ], and raises polish effectiveness in JP,62-278299,A which is the advanced technology is carried out, if time amount is maintained for several seconds in this high current field, the trouble which a base dry area

generates will occur.

[0006] Therefore, the electrolytic solution developed in order for both trimming, smoothing polish, etc. to be the electrolytic solutions for single processing and for the electrolytic solution which can carry out only processing of the single purpose but is inevitably used by one processing with the conventional electrochemical-machining technique to also carry out smoothing polish to coincidence with trimming grinding at once was in the situation which is not found out at all.

[0007]

[Problem(s) to be Solved by the Invention] To the electrochemical-machining technique of the conventional surface of metal described above, this invention relates to the electrolytic-solution constituent for carrying out electrochemical machining of electrolytic flash cutting and electrolytic polishing to a single, respectively, or carrying out to coincidence combining these two processings, in order to prepare to desired smoothness. The electrolytic-solution constituent for electrochemical machining of this invention is related with a suitable electrolytic-solution constituent, in order that this invention persons may acquire the effectiveness of desired electrochemical machining in the equipment and the approach for electrolytic flash cutting and electrolytic polishing which carried out patent application as Japanese Patent Application No. 4-301179, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, and Japanese-Patent-Application-No. 5-213202 grade.

[0008]

[Means for Solving the Problem] In order to assemble the electrolytic-solution constituent for carrying out individually electrochemical machining, such as electrolytic flash cutting of this invention, and electrolytic polishing, or carrying out these two electrochemical machining to coincidence Fundamentally [ all ], by making a workpiece side into an anode plate, in order to be stabilized continuously and to dissolve, the front face In order to dissolve the electrolyte which secures \*\* energization first to stability, and the surface of metal which is \*\* workpiece The oxidizer which promotes the metal ion dissolution from a front face, and the polarization improver which maintains concentration polarization in dissolving \*\* workpiece front face in homogeneity, \*\* Use fundamentally that a surface of metal corrodes by the etching nature component among various components, such as an inhibitor (inhibitor) to prevent, combining any one sort of \*\* of further the above - \*\*, or two sorts or more, including the electrolyte of the above-mentioned \*\*.

[0009]

[Detailed Description of the Means for Solving the Problem] Next, the electrolytic-solution presentation used in order to uniprocess one of electrolytic flash cutting and the electrolytic polishing or to process these two to coincidence is explained in detail below.

[0010] \*\* An electrolyte electrolyte's serving as a fundamental component which secures the energization nature of electrochemical-machining liquid, and energization nature's being in itself, and an electrolyte require that water solubility should make a good metal salt or a to some extent water-soluble metal salt, when the metal for the purpose of processing dissolves. The following electrolyte can be mentioned for this purpose.

[0011] - the sodium salt of simple substances, such as a sulfuric acid, a nitric acid, a hydrochloric acid, and a phosphoric acid, and a mixture and the above-mentioned acid, a potash salt, ammonium salt and a sodium hydroxide, and hydroxylation potash -- the concentration at the time of using the electrolyte of these as the electrolytic solution can be used between the solubility limits of each electrolyte from the concentration which can secure energization nature required of each electrochemical machining. If these electrolytes are energized by force by the concentration which cannot secure predetermined energization nature, the material by the side of an anode plate will start a base dry area, or will form the insoluble sex skin film in a front face. Moreover, since there is no merit in any way only by becoming a cost rise and the solubility of both electrolyte itself and other need components is checked even if it raises concentration more than solubility, it is not desirable.

[0012] \*\* An oxidizer oxidizer promotes the dissolution of the surface of metal which is a workpiece. It becomes possible to delete a surface of metal, and the gestalt assists that the hydrogen ion which is the stereo of the acid generated by PH fall near the anode plate when metal oxidation was carried out and the metallic oxide generated on the front face which is insolubility dissolves a metallic oxide in an acid, for example although based also on the class of a metal or oxidizer, and a metal dissolves easily [ when anode plate electrolysis is carried out under coexistence of an oxidizer ] from the surface of metal which is a processed material. Therefore, even if it takes which path, work of an oxidizer has as a result the effectiveness which promotes that a metal ion dissolves from an anode metal front face.



[0013] - oxidizing quality oxo acid salts, such as the acid of a chromic-acid compound and chloric acids and perchloric acid, such as a chromic anhydride, a chromate, and dichromate, and persulfuric acid itself, sodium, potash, and ammonium salt, -- the oxidizer of these can be desirably used by 1 - 220 g/L 0.5 to 250 g/L as concentration at the time of using it as the electrolytic solution like an electrolyte. These oxidizers cannot secure continuous oxidizing power in 0.5 or less g/L. Moreover, even if it covers the expenses [ g/L / 250 or more ] of concentration more than this, there is no merit in any way only by becoming a cost rise.

[0014] \*\* in dissolving a workpiece front face flat and smooth, a polarization improver polarization improver is \*\* which maintains concentration polarization, and is a component for which this invention persons promote the "YAKKE layer" formation described in the equipment and the approach for the electrolytic flash cutting and electrolytic polishing which carried out patent application as Japanese Patent Application No. 4-301179, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, and Japanese-Patent-Application-No. 5-213202 grade.

[0015] - Gelatin, a glycerol, starch, a carboxymethyl-cellulose Na salt (CMC), Amino carboxylic acids, such as a viscous grant agent meltable in water, such as sodium alginate, - glycine, and EDTA, 2Na, the salt of those, and - ethanolamines (Monod, JIE -, the Tori-ethanolamine, tri-isopropanolamine, etc.) : Polyalkylene polyamine : (Diethylenetriamine, triethylenetetramine, etc.) Hydroxy permutation polyalkylene polyamine (Hydroxyethyl ethylenediamine etc.) etc. ,s such as a compound which forms metals, such as sodium salt, such as a sodium potash salt of multiple-valued carboxylic acids, such as amines, - oxalic acid, and a malonic acid, - citric acid, a gluconic acid, and a tartaric acid, and a potash salt, and a stable fusibility complex compound, can be used. A polarization improver can be desirably used by 0.5 - 100 g/L 0.1 to 150 g/L as concentration at the time of using it as the electrolytic solution. In 0.1 or less g/L which is the minimum of concentration, there are too few additions, the desired smoothing effectiveness is not acquired, but the dissolution of an anode plate material is promoted too much by the case, or the viscosity of the electrolytic solution is gone up superfluously, and a problem is produced at 150 or more g/L.

[0016] \*\* A surface of metal corrodes by etching promotion nature components, such as an inhibitor oxidizing agent and a complexing agent, and inhibitor for acid washing, a rust-proofing nature component, etc. which are used widely industrially are equivalent to this of the component which prevents that the target surface state is spoiled.

[0017] Derivatives, such as the amine system organic substance, such as higher-fatty-acid (carboxylic acid with alkyl group of carbon numbers C10-C20) salts, such as a dicyclohexylammonium salt, fatty amines (an oleyl amine, stearyl amine, etc.), and polyalkylene polyamine (diethylenetriamine, triethylenetetramine, tetramethylen tetramine, etc.), dialkyl thiourea (alkyl: ethyl, butyl, etc.), a morpholine, an imidazole, and benzotriazol, etc. are used.

[0018] as the concentration at the time of using these inhibitors as the electrolytic solution -- 0.1-10g/L -- it can be desirably used by 0.5 - 5 g/L. In 0.1 or less g/L of the concentration minimum which can be used, the inhibitor effectiveness by these components is not acquired by satisfaction, and cannot control the base dry area of a surface of metal. Moreover, in 10 or more g/L of an upper limit, these are comparatively expensive components, even if it goes up concentration more than this, effectiveness cannot be expected, and it adsorbs [ these inhibitors / strongly ] to a surface of metal and is also harmful.

[0019] It becomes possible to process electrolytic flash cutting and electrolytic polishing individually, or to process to coincidence by combining the constituent of the electrolytic-solution constituent for electrochemical machining of this invention explained above.

[Function]

[0020] Although the electrochemical-machining nature excellent in using for the application of the electrolytic flash cutting and electrolytic polishing shown above is obtained, the electrolytic-solution constituent for electrochemical machining of this invention is as follows when work of the effectiveness and the component which are obtained by using this invention electrolytic solution is associated and explained.

[0021] To coincidence, forming a fusibility oxide film in the electrolyte for securing energization nature, and a processing front face with an oxide film Although work of the oxidizer which promotes that a metal ion is eluted from a surface of metal, and the inhibitor which is in a metaled electrolysis elution process, adsorbs in a surface of metal, and prevents corrosion is obvious in case a front face is protected or anode plate electrolysis is performed this invention persons are very important for the polarization improver in the electrolytic-solution constituent of this invention in the equipment and the approach of electrochemical machining which were

indicated in Japanese Patent Application No. 4-301179 which carried out patent application, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, and Japanese-Patent-Application-No. 5-213202 grade.

[0022] If electrochemical machining is performed using the equipment and the approach which are indicated by each above-mentioned patent application in the electrolytic solution with which a component and polarization improvers, such as an electrolyte, an oxidizer, and an inhibitor, live together, trimming grinding and smoothing polish can be properly used by a YAKKE layer's generating on a workpiece front face, or extinguishing it.

[0023] If thickness of a YAKKE layer is made very thin and anode plate electrolysis is carried out under the high voltage or a high current by controlling the thickness of a YAKKE layer, trimming grinding will be performed on an anode plate front face, and smoothing polish will come to be performed, if a YAKKE layer is thickened and is electrolyzed.

[0024] A polarization improver makes it possible to solubilize the metal ion eluted in the state of high concentration with a complexing agent near the anode plate which is a workpiece, to increase liquid viscosity, to promote that the YAKKE layer of hyperviscosity and high matter concentration is formed, and to process individually electrochemical machining, such as electrolytic flash cutting and electrolytic polishing, or to process to coincidence.

[Example]

[0025] Using the electrolytic solution for electrochemical machining of this invention, a concrete example is given to below and the effectiveness at the time of performing electrolytic flash cutting and electrolytic polishing is explained to a detail.

Electrolytic polishing of <example 1> brass : [an electrolytic-solution presentation and an electrolytic condition]

(Liquid presentation)

Ammonium sulfate 100g / L ammonium acetate 100 g/L (conditions)

Anode current density (DA) 3 A/cm<sup>2</sup> electrolytic-solution temperature Room temperature electrolysis time amount The rate of flow of the 3-second electrolytic solution Electrolytic polishing was performed on condition that the above using the continuation electrolytic device which showed yellow copper strip material (JIS H3100:C2600) with a 1m [ / ] second thickness [ of 0.36mm ] x width of face of 33.5mm in the equipment conceptual diagram of drawing 2 in Japanese Patent Application No. 5-213202 using the above-mentioned presentation. When the surface roughness of a material was compared before and after electrolytic polishing, after processing, 0.05 micrometers was obtained for that whose Ra value was 1.0 micrometers before processing.

[0026] Coincidence implementation of the electrolytic flash cutting of <example 2> brass, and electrolytic polishing: Using the same material as an example 1, and the same continuation electrolytic device, only the rate of flow of the electrolytic solution was carried out in 2m/second among electrolytic conditions, and the rest was made into the same conditions as an example 1, and carried out polish to coincidence with trimming. Although Ra of the cutting section in which the material before processing carried out weld flash generating, and the flat-surface section was 5 micrometers and 1.0 micrometers, respectively, it turns out that each Ra after processing was set to 1.0 micrometers and 0.05 micrometers, respectively, and polish was performed to coincidence with trimming.

[0027] Electrolytic polishing of <example 3> aluminum : [an electrolytic-solution presentation and an electrolytic condition]

(Liquid presentation)

Phosphoric acid 93wt% sulfuric acid 90 ml/L potassium dichromate 6 g/L (conditions)

Anode current density (DA) 1 A/cm<sup>2</sup> electrolytic-solution temperature Room temperature electrolysis time amount The rate of flow of the 2-second electrolytic solution Electrolytic polishing was performed on condition that the above using the continuation electrolytic device which showed aluminum \*\* material (JIS H4000:A5082) with a 1m [ / ] second thickness [ of 0.34mm ] x width of face of 27.5mm in the equipment conceptual diagram of drawing 3 of Japanese Patent Application No. 5-79713 using the above-mentioned presentation. When the surface roughness of a material was compared before and after electrolytic polishing, after processing, 0.01 micrometers was obtained for that whose Ra value was 1.5 micrometers before processing.

[0028] Iron electrolytic polishing : [an electrolytic-solution presentation and an electrolytic condition]

(Liquid presentation)

Sulfuric acid 50 ml/L citric acid 50 ml/L (conditions)

Anode current density (DA) 2 A/cm<sup>2</sup> electrolytic-solution temperature Room temperature electrolysis time amount The rate of flow of the 5-second electrolytic solution Electrolytic polishing was performed on condition that the above using the batch type electrolytic device which showed the cold rolled steel plate (JISG3141:SPCC-B) cut in 1m [ / ] second thickness [ of 0.6mm ] x die-length [ of 50mm ] x width of face of 50mm using the above-mentioned presentation in the equipment conceptual diagram of drawing 1 in Japanese Patent Application No. 4-301179. When the surface roughness of a material was compared before and after electrolytic polishing, after processing, 0.01 micrometers was obtained for that whose Ra value was 2.0 micrometers before processing.

[0029]

[Effect of the Invention] Electrochemical machining including electrolytic flash cutting and electrolytic polishing is indicated in Japanese Patent Application No. 4-301179 to which this invention persons did patent application of the electrolytic-solution constituent of this invention, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, and Japanese-Patent-Application-No. 5-213202 grade. By applying to the electrochemical-machining equipment and the processing approach of a certain batch type or continuous system, it becomes possible to carry either out individually among these electrolytic flash cutting and electrolytic polishing, or to carry out to these two coincidence.

[0030] Consequently, it can carry out now to coincidence respectively independently [ mirror-plane-izing by trimming of the metal end face after a press, and surface smoothing ] by combining the electrochemical-machining equipment and the electrochemical-machining approach (Japanese Patent Application No. 4-301179, Japanese Patent Application No. 5-28238, Japanese Patent Application No. 5-79713, Japanese Patent Application No. 5-132302, Japanese-Patent-Application-No. 5-213202 grade) for which the electrolytic-solution constituents and this invention persons of this invention have already applied.

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CLAIMS

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[Claim(s)]

[Claim 1] In the electrochemical-machining liquid constituent aiming at carrying individually one of electrolytic flash cutting and the electrolytic polishing out, or carrying out to coincidence combining both these Fundamentally among \*\* electrolyte, \*\* oxidizing agent, \*\* polarization improver, and \*\* corrosion inhibitor (inhibitor), including only the electrolyte of the above-mentioned \*\* Or the electrolyte of the above-mentioned \*\*, Furthermore, the electrolytic-solution constituent for electrochemical machining characterized by using combining any one sort or two sorts or more in in above \*\* - \*\*.

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[Translation done.]

DERWENT-ACC-NO: 1997-006886

DERWENT-WEEK: 199701

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TITLE: Precoated metal plate for containers, housings, etc. -  
by etching metal plate, laying plate with chemically  
converted treated coating, laying coating with resin  
film, etc.

PATENT-ASSIGNEE: NIPPON PAINT CO LTD[NIPA]

PRIORITY-DATA: 1995JP-0082392 (April 7, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES
MAIN-IPC			
JP <u>08276533</u> A	October 22, 1996	N/A	008
015/08			B32B

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
JP 08276533A	N/A	1995JP-0082392	April 7, 1995

INT-CL (IPC): B32B015/08, C23C022/00

ABSTRACTED-PUB-NO: JP 08276533A

BASIC-ABSTRACT:

A precoated metal plate is obtd. by: (1) etching (A) metal plate so that it has at least one pit of up to 1.0 mum max. breadth per m2 of the surface, (2) laying the etched plate (A) with (B) chemical conversion treated coat and (3) laying the coat (B) with (C) resin film.

USE - Used as moulding material for containers or housings.

CHOSEN-DRAWING: Dwg.0/0

TITLE-TERMS: PRECOAT METAL PLATE CONTAINER HOUSING ETCH METAL PLATE LAY PLATE  
CHEMICAL CONVERT TREAT COATING LAY COATING RESIN FILM

DERWENT-CLASS: M14 P73

CPI-CODES: M14-A; M14-D;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1997-001683

Non-CPI Secondary Accession Numbers: N1997-006293